



DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

Mr. Edge/mhb/AUTOVON
584-3502

REPLY TO
ATTENTION OF

HSBH-RH/WP

11 JUN 1982

SUBJECT: Radiation Protection Special Study No. 28-43-0263-82, Neutron Generator Facility, US Army Electronics Research and Development Command, Sandy Hook, NJ, 14 March 1982

Commander
US Army Materiel Development
and Readiness Command
ATTN: DRC SG
5001 Eisenhower Avenue
Alexandria, VA 22333

1. AUTHORITY. Letter, DRDEL-SS, HQ USAERADCOM, Adelphi, MD, 7 January 1982, subject: AEHA Survey of Sandy Hook Neutron Generator Facility, with indorsement thereto.

2. REFERENCES. See Inclosure 1 for a listing of references.

3. PURPOSE. The special study was performed to assess the radiological contamination in the Neutron Generator Facility located in Building 539, Gateway National Park, Sandy Hook, NJ.

4. GENERAL.

a. An entrance interview and exit briefing were held with COL Reynold, SC, Deputy Commander for Administration, ERADCOM; Dr. Walter S. McAfee, DAC, Scientific Advisor to the Commander, HQ ERADCOM; Mr. Steven Horne, DAC, RPO; Mr. Ron Kaese, DAC, Chief, Safety Office, HQ ERADCOM; and Dr. Johnson Choppola, DAC, ARPO, ERADCOM at Fort Monmouth.

b. This study was performed by Mr. Harris Edge, DAC; CPT Dann Ward, MSC; and CPT David Griffis, MSC, Health Physics Division, this Agency.

c. A list of abbreviations used in this report is included in Inclosure 2. Instrumentation used and calibration data are given in Inclosure 3. Inclosure 4 includes a diagram of the neutron facility and locations of gross alpha and beta wipe test samples. Inclosure 5 includes the results of gross alpha and beta wipe test samples. Inclosure 6 includes a diagram of the neutron facility and locations of tritium wipe test samples. Inclosure 7 includes the results of tritium wipe test samples.

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5. FINDINGS.

a. General.

(1) Mr. Steven Horne, DAC, was designated as the RPO; Mr. Barry S. Silber, DAC, and Dr. Johnson Choppola were designated ARPO's.

(2) The neutron generator was located in Building 539, Gateway National Park, Sandy Hook, NJ. The neutron generator was not operational at the time of this study. The tube housing unit and the target assembly had been removed from the neutron system.

b. Instrumentation Survey. The neutron facility was first surveyed with the PRM-7 "Micro-R" meter to check for low-level gamma radiation. This monitoring was followed by the use of the E-520 survey meter to check for beta radiation. The PAC-1SAGA was used to monitor the facility for alpha radiation. The following comments are provided.

(1) No beta-gamma exposure rate was detected above background. Background was determined to be 0.02 mR/hr. See Inclosure 3 for instrumentation and calibration techniques.

(2) The highest alpha reading observed from the PAC-1SAGA was less than 1 cpm. Background was also measured to be less than 1 cpm. See Inclosure 3 for instrumentation and calibration techniques.

c. Wipe Test Surveys. Two wipe test surveys were performed. One survey was performed to determine the gross alpha and beta removable contamination levels. Another survey was performed to determine removable tritium (H-3) contamination levels. The following results were obtained:

(1) Gross alpha results indicated that removable alpha contamination was less than the minimum detectable activity (less than 0.71 dpm per wipe test sample). See Inclosure 4 for location of wipe test samples and Inclosure 5 for gross alpha results.

(2) Gross beta results indicated that removable contamination levels ranged from 2.89 dpm to 1065 dpm. One wipe test sample exceeded 100 dpm and one exceeded 1000 dpm. The wipe test sample that exceeded 1000 dpm was analyzed on a gamma spectroscopy system to determine if gamma emission was present in the sample. The analysis indicated that no gamma emission was detected. See Inclosure 4 for location of wipe test samples and Inclosure 5 for gross beta results.

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(3) The tritium analysis indicated that removable contamination levels ranged from 64.3 dpm to 39,960 dpm per wipe test sample. See Inclosure 6 for location of wipe test samples and Inclosure 7 for tritium results.

6. CONCLUSION. A review of the findings indicated that radiological contamination levels exceeded the NRC regulatory guidelines for decontamination of facilities and equipment prior to release for unrestricted use. The following recommendations are provided.

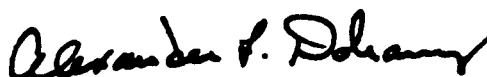
7. RECOMMENDATIONS.

- a. General. None.
- b. Instrumentation Survey. None.
- c. Wipe Test Surveys.

(1) Make a reasonable effort to eliminate residual contamination in Building 539, Gateway National Park, Sandy Hook, NJ, to levels that will not exceed those given in NRC Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.

(2) Perform a comprehensive radiation protection survey after decontamination to establish that contamination is within the limits specified in the Table of NRC Regulatory Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material.

FOR THE COMMANDER:



ALEXANDER L. DOHANY
LTC, MSC
Acting Director, Radiation
and Environmental Sciences

7 Incl
as

CF:
HQDA (DASG-PSP)
Cdr, ERADCOM
Cdr, HSC (HSPA-P)
Comdt, AHS (HSHA-IPM)
Cdr, MEDDAC, Ft Monmouth (PVNTMED Actv) (2 cy)
C, USAEHA-Rgn Div North

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REFERENCES

1. AR 40-5, Health and Environment, 25 September 1974.
2. AR 385-11, Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety), 1 May 1980.
3. Title 10, Code of Federal Regulations (CFR), 1981 rev, Part 19, Notices, Instructions and Reports to Workers; Inspections.
4. Title 10, CFR, 1981 rev, Part 20, Standards for Protection Against Radiation.
5. Title 10, CFR, 1981 rev, Part 21, Reporting of Defects and Noncompliance.
6. NRC Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material, November 1976.

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ABBREVIATIONS

ARPO	Alternate Radiation Protection Officer
CFR	Code of Federal Regulation
Ci	Curie
cm	Centimeter
cpm	Counts per minute
DAC	Department of Army Civilian
dpm	Disintegrations per minute
mCi	millicurie
MeV	Megaelectron Volts
mR/hr	milliroentgen per hour
NBS	National Bureau of Standards
NRC	Nuclear Regulatory Commission
RPO	Radiation Protection Officer
SN	Serial Number

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INSTRUMENTATION AND CALIBRATION TECHNIQUES

1. INSTRUMENTATION.

a. Model E-520 Ratemeter with HP-210 Geiger-Mueller Probe, SN 315, Eberline Instrument Corporation, calibrated 28 January 1982. (Used to measure mixed beta-gamma radiation.)

b. Model PAC-1SAGA Ratemeter with AC-3 Scintillation Crystal Probe, SN 1749, Eberline Instrument corporation, calibrated 19 January 1982. (Used to measure alpha radiation.)

c. Model PRM-7 "Micro-R" meter with 2-inch by 2-inch (SPA-3) Scintillation Crystals, SN 398, Eberline Instrument Corporation, calibrated 20 January 1982. (Used to measure low-level gamma radiation.)

2. CALIBRATION TECHNIQUES.

a. Model E-520 with HP-210 Probe. Calibrated to respond to 100 percent efficiency for pulse rates from the Model MP-1 minipulser, Eberline Instrument Corporation, calibrated 27 January 1982, traceable to NBS. An efficiency of approximately 35 percent was measured with Technetium-99 plated sources (0.097 MeV average beta energy) from the Model DNS-19, set of four calibration sources, Eberline Instrument Corporation, calibration 15 January 1982, traceable to NBS. The calculated efficiency was 10 percent for carbon-14 (0.052 MeV averaged beta energy) and 45 percent for strontium-yttrium-90 (0.182-0.733 MeV averaged beta energies). Probe surface area: 15 cm².

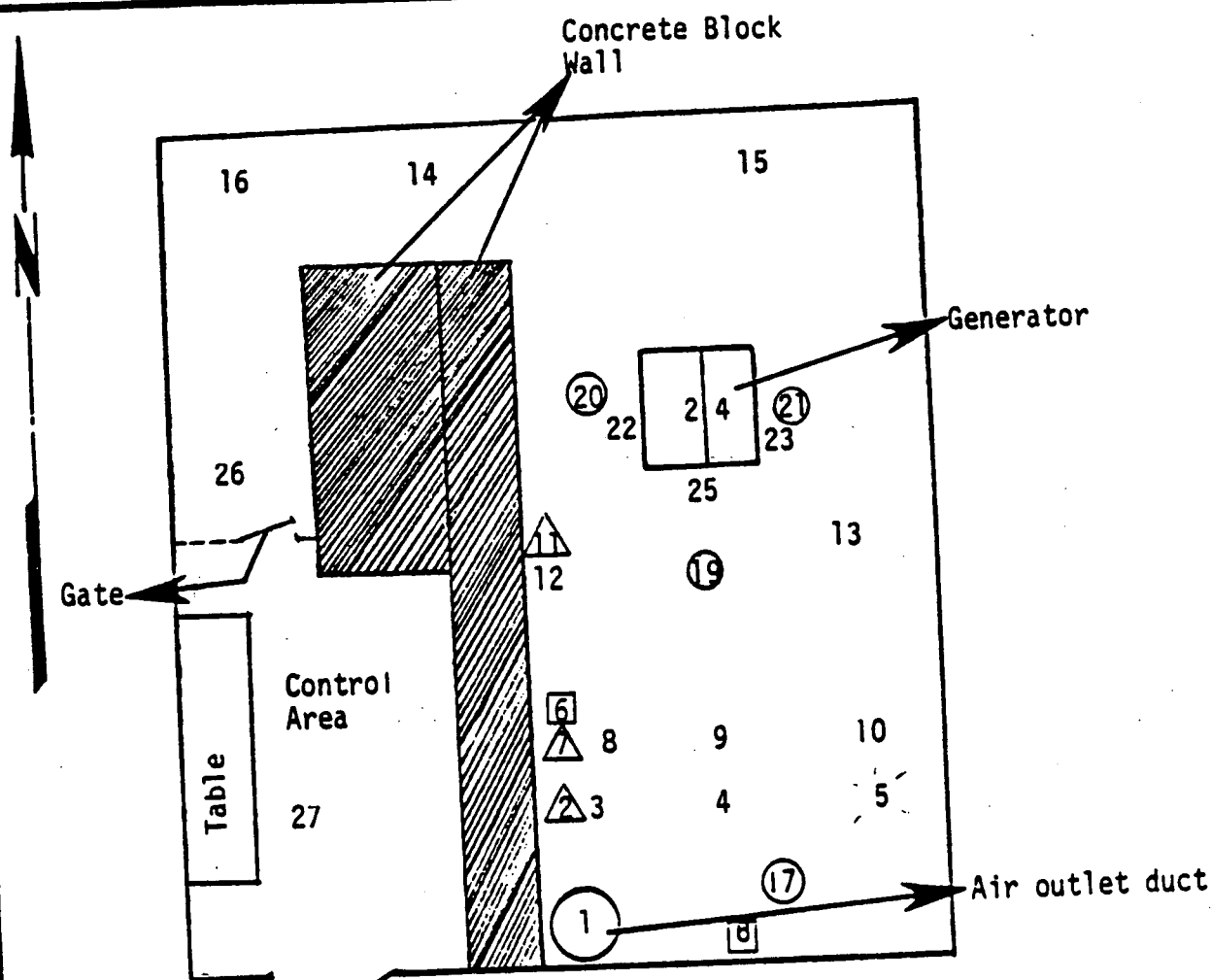
b. Model PAC1SAGA with AC-3 Probe. Calibrated to 100 percent efficiency of the actual alpha counting rate using Plutonium-239 plated sources (5.1 MeV alpha energy) using the UDM-6 set of four calibration sources, Eberline Instrument Corporation, calibrated 14 April 1981, traceable to NBS. Probe surface area: 59 cm².

c. Model PRM-7 with 2-inch by 2-inch Scintillation Probe. Calibrated on the highest scale (0-5000 microroentgen per hour) using the JL Shepherd 78-2 Cesium-137 Irradiator, 130 Ci and 130 mCi sources, calibrated 2 February 1981, traceable to NBS. A conversion factor of cpm per microroentgen per hour was determined on this range using the model MP-1 Minipulser. With this conversion, the minipulser was used to calibrate the lower scales of the PRM-7.

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GRAPHICAL ILLUSTRATION

For use of this form see AEHA Form 6 SOP; the proponent is HSE-AT.



Legend:

- | | | |
|----------------------------------|------------------------------|--------------------------------|
| 1. Air outlet duct | 12. Cement floor under mat | 23. Side of Generator (left) |
| 2. Rubber mat (top) | 13. Cement floor | 24. Top of Generator |
| 3. Cement floor water mat | 14. Cement floor | 25. Tube holding assembly |
| 4. Cement floor | 15. Cement floor | 26. Rubber mat under gate |
| 5. Cement floor | 16. Cement floor | 27. Rubber mat in control area |
| 6. South Wall | 17. Ceiling | |
| 7. Rubber mat (top) | 18. Ceiling | |
| 8. Cement floor under rubber mat | 19. Ceiling | |
| 9. Cement floor | 20. Ceiling | |
| 10. Cement floor | 21. Ceiling | |
| 11. Rubber mat (top) | 22. Side of Generator (left) | |

Gross Alpha-Beta Survey Wipe Test location, Building 539, Gateway National Park, Sandy Hook, NJ

DATE 14 April 82

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NTS

SCALE NA

PLATE NA

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UNITED STATES ARMY MEDICAL DEPARTMENT

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RESULTS OF ANALYZING GROSS ALPHA-BETA WIPE TEST SAMPLES

Sample	DPM Per Wipe Test Sample +2 Standard Deviations	
Identification	Gross Beta Activity	Gross Alpha Activity
1	<2.4	<0.71
2	<2.4	<0.71
3	55.5 + 6.7	<0.71
4	17.1 + 4.0	<0.71
5	119.9 + 8.9	<0.71
6	5.8 + 2.7	<0.71
7	12.4 + 3.3	<0.71
8	7.5 + 2.9	<0.71
9	26.6 + 4.4	<0.71
10	13.1 + 3.6	<0.71
11	9.5 + 3.1	<0.71
12	<2.4	
13	57.7 + 6.7	<0.71
14	3.3 + 2.2	<0.71
15	3.8 + 2.2	<0.71
16	4.9 + 2.4	<0.71
17	<2.4	<0.71
18	<2.4	<0.71
19	<2.4	<0.71
20	<2.4	<0.71
21	<2.4	<0.71
22	<2.4	<0.71
23	2.9 + 2.2	<0.71
24	<2.4	<0.71
25	37.7 + 4.4	<0.71
26	1065.6 + 22.2*	<0.71
27	5.1 + 2.4	<0.71

* Note: Wipe test sample No. 26 was analyzed on a gamma spectroscopy system to determine if gamma emission was present. No gamma radiation was detected; therefore, indicated that the primary radiation was beta.

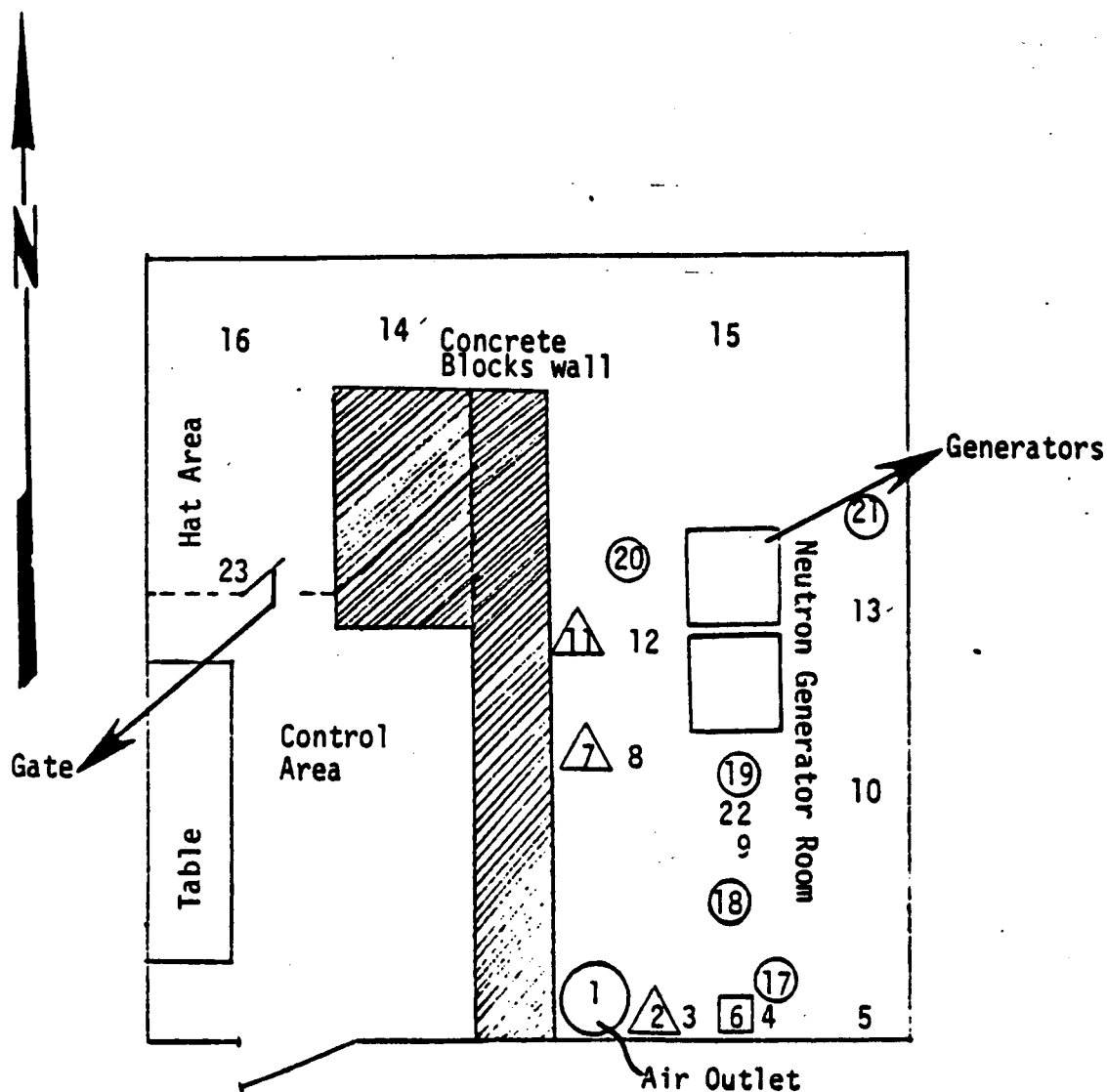
Alphus L. Jones
ALPHUS L. JONES

Chief, Radiological and Inorganic
Chemistry Division

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GRAPHICAL ILLUSTRATION

For use of this form see AEHA Form 6 SOP; the proponent is HSE-AT.



Legend:

- | | | |
|---------------------------|----------------------------|-------------------------------|
| 1. Exhaust vent | 9. Cement floor | 18. Ceiling |
| 2. Top of rubber mat | 10. Cement floor | 19. Ceiling |
| 3. Cement floor under mat | 11. Top of rubber mat | 20. Ceiling |
| 4. Cement floor | 12. Cement floor under mat | 21. Ceiling |
| 5. Cement floor | 13. Cement floor | 22. Holding Assembly for tube |
| 6. Center Wall | 14. Cement floor | 23. Top of rubber mat |
| 7. Top of rubber mat | 15. Cement floor | |
| 8. Cement floor under mat | 16. Cement floor | |
| | 17. Ceiling | |

Tritium Wipe test locations, Building 539, Gateway National Park, Sandy Hook, NJ

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UNITED STATES ARMY MEDICAL DEPARTMENT

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RESULTS OF ANALYZING TRITIUM WIPE TEST SAMPLES

Sample Identification	DPM Per Wipe Test Sample +2 Standard Deviations Tritium Activity
1	466.2 + 44.4
2	488.4 + 44.4
3	843.6 + 66.6
4	1731.6 + 88.8
5	39960.0 + 444.0
6	<48.8
7	2442.0 + 88.8
8	399.6 + 44.4
9	1265.4 + 66.6
10	2886.0 + 88.8
11	144.3 + 35.5
12	71.0 + 33.3
13	1709.4 + 88.8
14	1065.6 + 66.6
15	102.1 + 33.3
16	777.0 + 66.6
17	<48.8
18	<48.8
19	<48.8
20	<48.8
21	<48.8
22	910.2 + 66.6
23	64.4 + 33.6

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